

SECTION 11610 LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Bench-top laboratory fume hoods.
 - 2. Fume hood base cabinets with countertops.
 - 3. Laboratory sinks and cup sinks in fume hoods.
 - 4. Water, laboratory gas, and electrical service fittings in fume hoods.
- B. Related Sections include the following:
 - 1. Division 12 Section "Metal Laboratory Casework" for metal laboratory casework, including countertops, sinks, and service fittings.
 - 2. Division 15 Sections for fume hood duct connections, including ducts.
 - 3. Division 15 and 16 Sections for installing service fittings in fume hoods.
 - 4. Division 16 Sections for electrical connection of fume hoods.

1.3 PERFORMANCE REQUIREMENTS

- A. Containment: Provide fume hoods with the following performance ratings at a face velocity of 100 fpm and a release rate of 4.0 L/min. when tested according to ASHRAE 110:
 - 1. As-Manufactured Rating: AM 0.10.
 - 2. As-Installed Rating: AI 0.10.

1.4 SUBMITTALS

- A. Product Data: For each type of laboratory fume hood specified.
- B. Shop Drawings: For laboratory fume hoods. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Indicate locations of blocking and other supports required for installing fume hoods.
 - 2. Indicate locations and types of service fittings, together with associated service connections required.
 - 3. Indicate plumbing connections, duct connections, electrical connections, and locations of access panels.
 - 4. Include roughing-in information for mechanical, plumbing, and electrical connections.
 - 5. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
 - 6. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
 - 7. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for fume hood exterior, cabinets, and each type of top material indicated.
- D. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of fume hoods with requirements based on comprehensive testing of hoods.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain laboratory fume hoods through one source from a single manufacturer.
- B. Product Designations: Drawings indicate sizes and types of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' hoods of similar sizes and types, and complying with the Specifications may be considered. Refer to General and Supplementary Conditions section for "Substitutions."
- C. Fume Hood Standard: Provide fume hoods complying with the requirements of SEFA 1.1, "Laboratory Fume Hoods--Recommended Practices."
- D. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR, Part 1201 for Category II materials.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of SGCC or another certification agency acceptable to authorities having jurisdiction.

1.6 PRODUCT HANDLING

- A. Coordinate delivery of fume hoods with delivery of other laboratory casework components.
- B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.7 COORDINATION

- A. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Duralab Equipment Corp.
 - 2. Fisher Hamilton Scientific, Inc.
 - 3. Kewaunee Scientific Corp.; Laboratory Division.
 - 4. Labconco Corporation.

2.2 MATERIALS

- A. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 366 ; matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304, stretcher leveled, No. 4 finish.
- C. Glass-Fiber-Reinforced Polyester: Polyester laminate complying with ASTM D 4357, with a chemical-resistant gel coat on the exposed face, and having a flame-spread index of 25 or less when tested according to ASTM E 84.
- D. Epoxy: Factory-molded, modified, epoxy-resin formulation, uniform mixture throughout, full thickness with smooth, nonspecular finish.
 - 1. Physical Properties: Comply with the following minimum requirements:
 - a. Flexural strength: 15,000 psi.
 - b. Compressive strength: 30,000 psi.
 - c. Hardness (Rockwell M): 100.
 - d. Water absorption (24 hours): 0.02 percent (maximum).
 - e. Heat distortion point: 350 deg F.

- f. Thermal-shock resistance: Highly resistant.
 - 2. Flame Spread: 25 or less per ASTM E 84.
 - 3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, test procedure 3.9.5:
 - a. Acetone: Moderate effect.
 - b. Acetic acid (98 percent): No effect.
 - c. Hydrochloric acid (37 percent): No effect.
 - d. Nitric acid (70 percent): No effect.
 - e. Phosphoric acid (85 percent): No effect.
 - f. Sulfuric acid (33 percent): No effect.
 - g. Benzene: No effect.
 - h. Butyl alcohol: No effect.
 - i. Carbon tetrachloride: No effect.
 - j. Ethyl acetate: No effect.
 - k. Ethyl ether: No effect.
 - l. Formaldehyde: No effect.
 - m. Phenol (85 percent): No effect.
 - n. Xylene: No effect.
 - o. Ammonium hydroxide (28 percent): No effect.
 - p. Sodium hydroxide (50 percent): Moderate effect.
 - q. Zinc chloride: No effect.
- E. Phenolic Composite: Factory formed under high temperature and pressure from cellulose-fiber-reinforced phenolic resins with a pigmented, chemical-resistant, melamine-resin surface.
 - 1. Physical Properties: Comply with the following minimum requirements:
 - a. Flexural strength: 14,500 psi.
 - b. Compressive strength: 24,000 psi.
 - c. Hardness (Rockwell M): 95.
 - d. Water absorption (24 hours): 1 percent (maximum).
 - e. Heat distortion point: 350 deg F.
 - f. Thermal-shock resistance: Highly resistant.
 - 2. Flame Spread: 25 or less per ASTM E 84.
 - 3. Chemical Resistance: Composite material has the following ratings when tested with indicated reagents according to NEMA LD 3, test procedure 3.9.5:
 - a. Acetone: No effect.
 - b. Hydrochloric acid (37 percent): No effect.
 - c. Hydrofluoric acid (50 percent): No effect.
 - d. Nitric acid (70 percent): No effect.
 - e. Perchloric acid (70 percent): No effect.
 - f. Phosphoric acid (85 percent): No effect.
 - g. Sulfuric acid (33 percent): No effect.
 - h. Carbon tetrachloride: No effect.
 - i. Ethyl ether: No effect.
 - j. Furfural: No effect.
 - k. Naphtha: No effect.
 - l. Toluene: No effect.
 - m. Ammonium hydroxide (28 percent): No effect.
 - n. Sodium hydroxide (20 percent): No effect.
 - o. Zinc chloride: No effect.
 - p. Gentian violet: No effect.
- F. Laminated Safety Glass: ASTM C 1172, Kind LT; Kind FT, Condition A, Type I, Class I, Quality q3 lites with clear, polyvinyl butyral interlayer.

2.3 BYPASS FUME HOODS

- A. Provide fume hoods with compensating bypass above sash, which opens as sash is closed, to limit air velocity to 4-1/2 times the face velocity with sash open. Provide hoods designed to operate with a face velocity of 100 fpm with sash fully open.
- B. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- C. Provide airfoil vane at bottom of opening to direct airflow across work surface with 1-inch open space between foil and front edge of countertop. Extend airfoil under sash so sash closes on top of foil.
- D. Equip fume hoods with auxiliary-air system that supplies air from an external source to the face of the hood equal to 70 percent of the exhausted air volume. Auxiliary air shall be introduced directly above and immediately in front of hood face. Capture efficiency of hoods shall be 90 percent minimum.

2.4 RESTRICTED BYPASS FUME HOODS

- A. Provide fume hoods with partial compensating bypass above sash, which opens after sash is closed to less than 40 percent open. Design partial bypass to maintain sufficient exhaust air volume through hood to adequately dilute hazardous fumes, regardless of sash position. Provide hoods designed to operate with a face velocity of 100 fpm with sash fully open.
- B. Variable Air Volume Control: Equip fume hoods with an electronic control unit with a sensing device that monitors face velocity and a motorized damper on the exhaust connection that maintains a constant face velocity by controlling air volume in response to control unit.
 - 1. Provide electronic control unit that also monitors sash position and anticipates changes in face velocity caused by abrupt changes in sash position.
 - 2. Provide output transmitter on electronic control unit that produces 0- to 10-V, dc signal proportional to fume hood exhaust volume for interface with building's HVAC control system.
- C. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
- D. Provide airfoil vane at bottom of opening to direct airflow across work surface with 1-inch open space between foil and front edge of countertop. Extend airfoil under sash so sash closes on top of foil.

2.5 FABRICATION

- A. Steel Exterior: Fabricate from steel sheet, 0.0478 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil, and to allow access to plumbing lines and service fittings. Apply finish to interior and exterior surface of component parts before final assembly.
- B. Ends: Double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.
- C. Interior Lining: Unless otherwise indicated, provide fume hoods with linings of the following material:
 - 1. Material: Glass-fiber-reinforced polyester not less than 1/4 inch thick.
- D. Molded Glass-Fiber-Reinforced Polyester Lining: Molded unit consisting of end panels, back panel, preset rear baffle, and top bonded together into a single piece and reinforced to form a rigid assembly to which exterior is attached.
 - 1. Punch fume hood lining side panels to receive remote controls and service fittings as indicated. Furnish removable plug buttons for holes not used for indicated fittings.

- E. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining.
 - 1. Provide stainless-steel, epoxy-coated steel, or glass-fiber-reinforced polyester duct stub for exhaust connection.
- F. Bypass Grilles: For fume hoods with bypass operation specified, provide bypass grilles to conceal plenum, with required free opening.
- G. Sash: Provide operable sashes of type indicated. Fabricate from 0.0500-inch-thick stainless steel into 4-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.
 - 1. Glaze with laminated safety glass, with 3-mm-thick plies.
 - 2. Counterbalance vertical sliding sash with sash weight and stainless-steel cable system. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.
 - 3. Fabricate horizontal sliding sash with adjustable nylon-tired, ball-bearing sheaves on stainless-steel track. Sash shall bypass and be removable. Provide flush finger pulls and rubber bumpers at both stiles of each sash.
- H. Lights: Provide a vapor-proof, 2-tube, rapid-start, fluorescent light fixture, of longest practicable length, complete with tubes at each fume hood. Shield tubes from hood interior by 1/4-inch-thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Set units so fluorescent tubes are easily replaceable from outside of hood.
 - 1. Provide fluorescent tubes with a color temperature of 3,500 K and a minimum color rendering index of 85.
- I. Base Cabinets: Comply with requirements of Division 12 Section "Metal Laboratory Casework."
- J. Countertops and Cup Sinks: Unless otherwise indicated, provide countertops and cup sinks as follows:
 - 1. Epoxy Tops: Fabricate with front overhang of 1 inch over base cabinets, formed with continuous drip groove on underside 1/2 inch from edge and with factory cutouts for sinks.
 - a. Top Configuration: Raised marine edges.
 - b. Top Thickness: 1-1/4 inches.
 - 2. Cup Sinks: 3-by-6-inch nominal size with 1-1/2-inch NPS outlets with strainers and tailpieces a minimum of 6 inches, of the same material as sink, or as otherwise approved by CM.
 - 3. Unless otherwise indicated, provide epoxy or phenolic-composite tops and epoxy or polypropylene cup sinks.
- K. Filler Strips: Wood or metal, as applicable to match adjoining surfaces. Provide as necessary to close openings between fume hood base cabinet or hood exterior and adjacent building construction.
- L. Fasteners: Provide stainless-steel fasteners where exposed to fumes in hood.

2.6 ACCESSORIES

- A. Service Fittings: Comply with requirements of Division 12 Section "Metal Laboratory Casework."
 - 1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant, baked-on plastic coating in manufacturer's standard metallic brown, aluminum, or other color as approved by CM.
- B. Airflow Indicator: Provide fume hoods with airflow indicator of the following type:
 - 1. Indicator Type: Direct-reading aneroid (Magnehelic-type) gage that measures fume hood exhaust duct static pressure as an indication of airflow.
- C. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.

1. Provide with either thermal-anemometer or aneroid (Magnehelic-type) gage airflow sensor.
 2. Provide with reset and test switches.
 3. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.
- D. Sash Alarm: Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position.
1. Provide with silence and test switches.
- E. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning hood and for placing large apparatus within hood.
- F. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.
- 2.7 SOURCE QUALITY CONTROL

- A. Demonstrate fume hood performance before shipment by testing according to ASHRAE 110. Provide testing facility, instruments, equipment, and materials needed for tests.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install plumb, level, aligned, and securely anchored to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where hoods abut other finished work, apply filler strips and scribe for accurate fit with fasteners concealed where practical.
- B. Comply with requirements of Division 15 and 16 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings and manufacturer's written instructions. Securely anchor fittings, piping, and conduit to fume hoods and casework, unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

- A. Field test hoods according to fume hood standard after completing installation to demonstrate proper operation. Also test one hood selected by CM, for each type of hood installed, according to ASHRAE 110 to verify performance. If any hood tested for performance fails to perform as specified, field test additional hoods as directed by CM.
1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.

3.3 ADJUSTING AND CLEANING

- A. Adjust moving parts for smooth, near-silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.
- B. Repair or remove and replace defective work as directed on completion of installation.
- C. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by CM.

END OF SECTION 11610